DOCUMENT RESUME

ED 432 439 SE 060 317

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TITLE The Mathematics and Reading Connection. ERIC Digest.

INSTITUTION ERIC Clearinghouse for Science, Mathematics, and Environmental Education, Columbus, OH.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
REPORT NO EDO-SE-97-02
PUB DATE 1997-06-00
NOTE 4p.
CONTRACT RI-93002013
AVAILABLE FROM ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 1929 Kenny Road, Columbus, OH 43210-1080.
PUB TYPE ERIC Publications (071) -- ERIC Digests in Full Text (073)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Classroom Environment; Concept Formation; Constructivism (Learning); *Content Area Reading; Elementary Secondary Education; Environmental Education; *Interdisciplinary Approach; *Mathematics Instruction; Metacognition; *Numeracy; Science Activities; Science Curriculum; *Writing Across the Curriculum
IDENTIFIERS ERIC Digests

ABSTRACT

This digest describes an interdisciplinary approach to instruction based on the relationship between reading, writing, and arithmetic. Questions related to which language learning strategies apply to mathematics, the perspectives of the National Council of Teachers of Mathematics (NCTM) regarding this approach, the impact of reading on mathematical process and skills, and the nature of mathematical literacy are answered with regard to students in kindergarten through tenth grade. (DDR)

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A children's rhyme linked the domains of the three Rs—reading, 'riting and 'rithmetic—long before the whole language philosophy or integrated curriculum became focal points for educators. Letters, symbols, and numbers are the primary methods of communication in the world. This includes the universal sharing of ideas, concepts, data, and information. This common role in society creates a natural connection for the integration of reading and mathematics in the school curriculum.

Success in reading and mathematics is based on process skills that incorporate the integration of contextual information and with prior knowledge to produce meaning. The development of the skills involved in these domains could be considered the four Cs: construction, collaboration, context, and communication. Knowledge is actively constructed in each of these areas. In reading, letters form words that symbolize objects, attributes or action. In mathematics, numbers symbolize amounts, patterns or relationships. These words and numerical expressions create a basis for additional focus or information processing. This knowledge can be constructed and enhanced through collaboration with others in the classroom or workplace. Knowledge is communicated with others to share, compare and assess information.

Which strategies of learning language can be applied to the learning of mathematics?

Jennie Bickmore-Brand (Bickmore-Brand, 1993) identifies seven language learning strategies that can be applied to enhance the learning of mathematics. They include:

- Creating a meaningful and relevant context for the knowledge, skills and values of mathematics.
- Realizing the starting point of interest in mathematics is the knowledge base of the student.
- Providing opportunities for the learner to see the skills, processes and values of mathematics by the teacher's modeling.
- Continuing to build on the knowledge base and challenging the students-scaffolding.
- Facilitating the metacognition of the student by helping the student identify the learning processes and how he or she learns.
- Assisting the learner to accept the responsibility for the construction of knowledge.
- Building a community of learners in a risk-free learning environment.

These strands should be interwoven into the classroom environment to aid in the content, methodology, and assessment in mathematics. Bickmore-Brand suggests that these steps will create a positive association with mathematics and mathematical relevancy in society.

What does the National Council of Teachers of Mathematics say about the interdisciplinary approach of teaching mathematics with reading?

The National Council of Teachers of Mathematics (NCTM, 1989) acknowledged the integration between the domains of mathematics and reading with the inclusion of Standard 2 "Mathematics as Communication" in the *Curriculum and Evaluation Standards for School Mathematics*. The emphasis for the grade groupings follows.

Grades K-4:

- Mathematics can be thought of as a language.
- Reading children's literature about mathematics, and eventually text material, needs more emphasis in the K-4 curriculum.
- Children can meaningfully learn mathematics; teachers can help the process by providing opportunities for them to communicate and to "talk math" with their friends.
- Use connections to construct knowledge, learn alternative ways to think about ideas, clarify thinking, and communicate about problems.

Grades 5-8:

- Use the skills of reading, listening, and viewing to interpret and evaluate mathematical ideas.

Grades 9-10:

- Use of skills provides opportunities for interpretation of data and statistics regarding social issues. In this manner, mathematics helps students develop an understanding of the events in society.

The NCTM also acknowledges this linkage in its other publications, including the 1995 Yearbook, *Connecting Mathematics across the Curriculum*, and the 1996 Yearbook, *Communication in Mathematics K-12 and Beyond*. The 1995 yearbook focuses on the connections of mathematics in all areas and all levels of the school curriculum. It specifically addresses the topic for elementary school curriculum in a chapter by David J. Whitin, "Connecting Literature and Mathematics" who suggests that children's literature can help students meaningfully connect their world to the the world of mathematical ideas. The 1996 Yearbook focuses on building a discourse community of meaningful mathematical communication within classrooms and beyond. One of the sections for such a changing

paradigm is reading. Topics included for discussion are the use of trade books, metaphorical thinking, reading to construct meaning, and communicating mathematics through literature. The NCTM is promoting collaboration of reading and mathematics.

What is the impact of reading on mathematical process and skills?

Reading provides both context and motivation for the mathematics students. Reading from a text book, trade book, or newspaper article can provide the students with a shared basis for receiving and sharing information. Reading can supply a common setting, environment, and details for application of students' mathematical skills. Reading provides an interesting context that students can explore. This exploration can occur either in a group with many students or with one student. In general, the integration of math and reading creates a relevant context for the formal and abstract mathematical processes.

The use of either fiction or non-fiction material can create the context for discussion and set the stage for mathematical skills. The specific areas may include:

- Posing questions in mathematics.
- Sequencing events in a story.
- Questioning and seeking additional information students would like to know about a topic.
- Developing recording skills.
- Comparing and contrasting. For example, a Venn Diagram can be used to compare and contrast different versions of the same story.
- Constructing charts and graphs to illustrate or determine the impact of details.
- Counting through one-to-one correspondence.
- Predicting and hypothesizing. For example, examing stories for patterns like this one: introduction, development of details and theme, climax, and conclusion.
- Validating or persuading, using data or details to determine and support a particular position.
- Conferring with others to generate new knowledge or to confirm a position on a topic.

What is mathematical literacy?

With support for the connections between the strategies, processes, and skills within the domains of reading and mathematics, can an argument be made for mathematical literacy? David Whitin, Heidi Mills and Timothy O'Keefe present an argument for such a concept in *Living and Learning Mathematics, Stories and Strategies for Supporting Mathematical Literacy*. The authors maintain that students become mathematically literate the same way they become literate in reading. Mathematics is more than numbers just as reading is more that letters. Literacy involves placing numbers into meaningful context in daily living. It is demonstrated by students putting numbers to good use within the structure of their lives, their stories and their literature. Students work together, observing and investigating uses of numbers, asking questions, and planning strategies, to find the answers. These are the kinds of activities that can create and support the environment for mathematical literacy.

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SE 060 317

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EDO-SE-97-02

This digest was funded by the Office of Educational Research and Improvement, U.S. Department of Education under contract no. RI-93002013. Opinions expressed in this digest do not necessarily reflect the positions or policies of OERI or the Department of Education.

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